Welcome Remarks & MassBioEd’s 2021 Life Sciences Employment Outlook and Q&A

Sunny Schwartz, Executive Director, MassBioEd

Karla Talanian, Director of Talent and Workforce Development, MassBioEd
Our mission is to build a sustainable life sciences workforce in the region through educational programs that engage and excite teachers, inspire and propel students, and illuminate the pathway from the classroom to career with a focus on expansion, opportunity and diversity.
Programs

Incumbent Workforce
Building skills of the current workforce

Emerging Workforce
Engaging educators, inspiring students grades K-12

Imminent Workforce
Illuminating careers for college students and adults

MassBioEd
Impact graphic

15,000
Students served in hands-on labs and college and career exploration events

>50%
Schools reached were low or very low income

30+
Companies and universities served as Career Ambassadors and event hosts

200+
Teachers received hands-on training in leading authentic biotechnology labs

350+
People accessed our annual Massachusetts Life Sciences Employment Outlook report

99%
Teachers reported acquiring greater knowledge & confidence

220
Professionals obtained new skills through professional development courses

MassBioEd’s programs and services are designed for SUCCESS.
Join Our Mission

Get involved in our mission through volunteering, contributing, or engaging your company in a variety of ways:

- Become a Career Ambassador
- Host a College or Career Exploration Event
- Become an Apprenticeship Employer
- Donate
Thank you to our sponsors

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Alnylam Biogen ALEXANDRIA

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MassBioEd

Expanding the Pool of Workers: Specific Workforce Challenge Areas

Presentations and Facilitated Group Discussions:

Inspiring College Students to Pursue STEM Careers
Led by Fred Lesley, Director Center for Integration of Science and Industry at Bentley University and Liz Zulick, Director of Lowell Institute School at Northeastern University

Ending Talent Wars: Growing the Clinical Research Talent Pool
Led by Marny Lazar, Vice President, Global Clinical Development Operations at Jounce Therapeutics

Big Tech vs. Biotech: Winning the Competition for Talent in Data Science
Led by Jay Mattetel, Director, Oncology Bioscience at AstraZeneca and Sarita Pillai, Director of STEM & Workforce Success at Education Development Center

Hiring and Securing Foreign-Born Talent
Led by Jennifer Machat, Director, DEI Recruiting, Early Career & Talent Marketing at Sanofi

Meeting the Growing Demand for Biomanufacturing Talent
Led by Jeffrey Savard at Bristol Myers Squibb and Craig Meinhardt at Pfizer

Building Inclusivity and Belonging Into Our Workplaces
Led by Wendy Richards, Director of CSR and Community Relations at Sanofi

Shifting Strategies: Industry Opportunities to Fill the Talent Gap
Led by Krista Licata, Managing Director at LabCentral
Life Sciences Employment and Hiring Demand Trends and Implications for the Industry and the Region

Karla Talanian
Director, Talent & Workforce Development, MassBioEd
Big Picture

1. Aggregate Employment Picture
2. Hiring Demand Trends & Comparisons

Drilling Down

3. What - and Who - Do Employers Want?

The Talent Pipeline

4. Who Are the Life Science Employees of the Future?
Big Picture

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4. Who Are the Life Science Employees of the Future?
Total Massachusetts Life Science Employment 2020: **89,424**

<table>
<thead>
<tr>
<th>Employment Growth</th>
<th>Massachusetts</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-2020</td>
<td>67%</td>
<td>35%</td>
</tr>
<tr>
<td>2019-2020</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>
MA Industry Location Quotient = 3.60

or 3.6X more concentrated than U.S. average

<table>
<thead>
<tr>
<th>State</th>
<th>Location Quotient (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>1.27</td>
</tr>
<tr>
<td>New Jersey</td>
<td>2.57</td>
</tr>
<tr>
<td>North Carolina</td>
<td>2.38</td>
</tr>
<tr>
<td>Illinois</td>
<td>1.59</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1.41</td>
</tr>
<tr>
<td>Indiana</td>
<td>2.61</td>
</tr>
</tbody>
</table>

Employment Trend for MA and U.S. Life Sciences Industry and Total Private Sector, 2017-20
Total Massachusetts Life Science Employment Projected Growth:

109,424 Total Jobs by 2024
Who Is Employed by the Massachusetts Life Sciences Industry?
### Employment Highlights: Specific Occupations

<table>
<thead>
<tr>
<th>Occupation</th>
<th>2020 Employment Total</th>
<th>Change in Employment 2017-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Scientists</td>
<td>10,457</td>
<td>30%</td>
</tr>
<tr>
<td>IT occupations (software developers, computer systems analysts, etc.)</td>
<td>4,100</td>
<td>47%</td>
</tr>
<tr>
<td>Biochemists and Biophysicists</td>
<td>3,951</td>
<td>14%</td>
</tr>
<tr>
<td>Biological Technicians</td>
<td>3,900</td>
<td>13%</td>
</tr>
<tr>
<td>Project Managers</td>
<td>2,498</td>
<td>160%</td>
</tr>
<tr>
<td>Industrial engineers</td>
<td>2,182</td>
<td>29%</td>
</tr>
<tr>
<td>Mechanical engineers</td>
<td>2,051</td>
<td>-9%</td>
</tr>
<tr>
<td>Microbiologists</td>
<td>1,300</td>
<td>58%</td>
</tr>
</tbody>
</table>
Occupational Breakdown of Employment in the Life Sciences Industry – MA and U.S.
What does all this result in?

- 2,056 Drug Candidates
- 16 candidates pending FDA approval
- 12% of US Pipeline
- 6% of Global Pipeline

Examples of medical indications MA companies are working on:

- Solid Tumors: 166 INDs
- Alzheimer’s Disease: 34 INDs
- Cystic Fibrosis: 34 INDs
- Ovarian Cancer: 27 INDs
- Pancreatic Cancer: 17 INDs
- Sickle Cell Disease: 17 INDs
<table>
<thead>
<tr>
<th>Major industry group</th>
<th>Direct jobs</th>
<th>Supplier jobs</th>
<th>Induced jobs</th>
<th>Total indirect jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td>100</td>
<td>515</td>
<td>442</td>
<td>958</td>
</tr>
<tr>
<td>Real estate and rental leasing</td>
<td>100</td>
<td>397</td>
<td>483</td>
<td>880</td>
</tr>
<tr>
<td><strong>Scientific research and development services</strong></td>
<td><strong>100</strong></td>
<td><strong>519</strong></td>
<td><strong>324</strong></td>
<td><strong>843</strong></td>
</tr>
<tr>
<td>Pharmaceutical and medicine manufacturing</td>
<td>100</td>
<td>394</td>
<td>180</td>
<td>575</td>
</tr>
<tr>
<td>Information</td>
<td>100</td>
<td>252</td>
<td>321</td>
<td>573</td>
</tr>
<tr>
<td>Arts, entertainment, and recreation</td>
<td>100</td>
<td>123</td>
<td>255</td>
<td>379</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>100</td>
<td>150</td>
<td>215</td>
<td>364</td>
</tr>
<tr>
<td>Construction</td>
<td>100</td>
<td>88</td>
<td>138</td>
<td>226</td>
</tr>
<tr>
<td>Health care and social assistance</td>
<td>100</td>
<td>69</td>
<td>136</td>
<td>206</td>
</tr>
<tr>
<td>Educational services</td>
<td>100</td>
<td>64</td>
<td>130</td>
<td>194</td>
</tr>
<tr>
<td>Retail trade</td>
<td>100</td>
<td>47</td>
<td>75</td>
<td>122</td>
</tr>
<tr>
<td>Food and beverage stores</td>
<td>100</td>
<td>31</td>
<td>41</td>
<td>71</td>
</tr>
</tbody>
</table>
Big Picture

1. Aggregate Employment Picture
2. Hiring Demand Trends & Comparisons

Drilling Down

3. What - and Who - Do Employers Want?

The Talent Pipeline

4. Who Are the Life Science Employees of the Future?

Big Picture

2. Hiring Demand
Trend in MA Life Science Industry Job Postings, 2017-20
Take Home Message:

The Life Sciences Industry is a vital - and growing - part of the entire Massachusetts business ecosystem.

The products of our work make people healthier and improve quality of life for patients and families.

This industry has an outsized effect on the overall health and vitality of the Massachusetts economy.
Drilling Down

3. What - and Who - Do Employers Want?

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4. Who Are the Life Science Employees of the Future?
Educational Requirements in MA and U.S. Life Science Job Postings, 2017-20

- MA:
  - Ph.D. or professional degree: 18%
  - Master's degree: 25%
  - Bachelor's degree: 47%
  - Associate's degree: 4%
  - High school or GED: 7%

- U.S.:
  - Ph.D. or professional degree: 12%
  - Master's degree: 19%
  - Bachelor's degree: 48%
  - Associate's degree: 7%
  - High school or GED: 14%
Leading Job Titles in Life Science Industry by Job Postings, 2017-20

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Hiring Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists - General Research</td>
<td>10,518</td>
</tr>
<tr>
<td>Management - General</td>
<td>9,405</td>
</tr>
<tr>
<td>Data Scientists</td>
<td>5,618</td>
</tr>
<tr>
<td>Medical Scientists</td>
<td>4,484</td>
</tr>
<tr>
<td>Quality Assurance &amp; Control</td>
<td>4,242</td>
</tr>
<tr>
<td>Sales &amp; Account Representatives</td>
<td>3,825</td>
</tr>
<tr>
<td>Regulatory Affairs</td>
<td>2,587</td>
</tr>
<tr>
<td>Medical Directors</td>
<td>2,178</td>
</tr>
<tr>
<td>Business Misc</td>
<td>1,612</td>
</tr>
<tr>
<td>Project Mgmt</td>
<td>1,550</td>
</tr>
<tr>
<td>IT - Software Engineers/Developers</td>
<td>1,135</td>
</tr>
<tr>
<td>Engineers - General</td>
<td>1,120</td>
</tr>
<tr>
<td>Technicians - Medical</td>
<td>1,092</td>
</tr>
<tr>
<td>Engineers - Industrial</td>
<td>915</td>
</tr>
<tr>
<td>Production - Supervisors</td>
<td>903</td>
</tr>
<tr>
<td>Medical Science Liaisons</td>
<td>821</td>
</tr>
<tr>
<td>Scientists - Chemists</td>
<td>819</td>
</tr>
<tr>
<td>Financial - Analysts</td>
<td>808</td>
</tr>
<tr>
<td>Clinical Trial Managers &amp; Coordinators</td>
<td>747</td>
</tr>
<tr>
<td>Production - General</td>
<td>717</td>
</tr>
</tbody>
</table>

Since 2010

- Hiring Demand for Management has increased 167%
- Hiring Demand for Life Scientists has increased 76%
Most challenging positions to fill:

• Regulatory Affairs
• Research Scientists
• Data Sciences (Computational Biology/Statistics)
• Engineering & Product and/or Process Development

Expected areas of high-volume hiring over the next year:

• Manufacturing & Production
• Quality Control/Assurance
• Research Scientists

2021 Hiring Survey Responses
Survey was done by TEConomy, MassBioEd, and the Coalition of State Bioscience Institutes.
Take Home Message:

There is a strong need for hyper-skilled and highly educated scientists...

A growing need for people with managerial and operational expertise as companies mature from startup phase into clinical and commercial entities.

And an impending need for technical support and for people to run manufacturing operations as the industry matures.
The Talent Pipeline

4. Who Are the Life Science Employees of the Future?
Growth in Massachusetts Life Science Graduates by Degree Level, Selected Years 2010-19

- **Associate's degree**
  - 2010: 116
  - 2015: 209
  - 2019: 295
  - **154% increase**

- **Bachelor's degree**
  - 2010: 3220
  - 2015: 4399
  - 2019: 4988
  - **55% increase**

- **Master's degree**
  - 2010: 648
  - 2015: 1118
  - 2019: 1382
  - **113% increase**

- **Doctorate**
  - 2010: 478
  - 2015: 546
  - 2019: 638
  - **33% increase**

Life Sciences Workforce 2021
MassBioEd's 6th Annual Conference
June 2nd • 10:00 AM - 3:00 PM
Growth in Life Science Graduates by Degree Level - Four-Year Trend 2015-19

- Associate's degree: 41.1% in MA, 43.8% in U.S.
- Bachelor's degree: 13.4% in MA, 11.3% in U.S.
- Master's degree: 23.6% in MA, 24.4% in U.S.
- Doctorate: 16.8% in MA, 0.4% in U.S.
Growth in All Life Science Degree Graduates AS - PhD

MA Life Sciences Degrees as a Share of Total

- MA: 5.5%
- U.S.: 4.1%

Growth in Life Sciences Degrees

- MA:
  - 2010-19: 64%
  - 2015-19: 16%

- U.S.:
  - 2010-19: 47%
  - 2015-19: 13%
Since 2010:

- Massachusetts life science employment has grown 67%
- Massachusetts life science hiring demand for managers has grown 167%
- Massachusetts life science hiring demand for scientists has grown 76%

Increase in Massachusetts life sciences graduates:
- Combined MA 64%
- Combined US 47%
We Don’t Have to Lose STEM Students to Business, Naomi L. B. Wernick1* and Fred D. Ledley2, https://doi.org/10.1128/jmbe.v21i1.2095
Foreign-Born Workers’ Share of Occupational Employment by Degree Level, 2017

- Bachelor’s: 22% (All S&E Occupations) / 17% (Life Sciences Occupations)
- Master’s: 39% (All S&E Occupations) / 31% (Life Sciences Occupations)
- Doctorate: 38% (All S&E Occupations) / 34% (Life Sciences Occupations)
Temporary Visa Holders as a Percentage of all PhD Recipients in the U.S., by Major Field of Study, 2010 and 2019

- Biological and biomedical sciences
- Chemistry
- Mathematics and statistics
- Chemical engineering
- Health sciences
- Computer and information sciences
- Bioengineering and biomedical engineering
Take Home Message:

Supply is not keeping up with demand.

There is no clear end in sight to the competition for talent.

The future of the Massachusetts Life Sciences industry depends on growing the pool of trained, qualified people who can do this work.
The Massachusetts life sciences industry currently leads the world.

Our continued success depends on a world-class workforce.
<table>
<thead>
<tr>
<th></th>
<th>Investor Owned</th>
<th>Owner Occupied</th>
<th>Total</th>
<th>Full Pipeline (thru ‘24)</th>
<th>Pipeline Underway</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R&amp;D (lab)</strong></td>
<td>26.3</td>
<td></td>
<td></td>
<td>18.3</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>GMP</strong></td>
<td>2.7</td>
<td></td>
<td></td>
<td>1.2</td>
<td>0.87</td>
</tr>
<tr>
<td><strong>Total (R&amp;D + GMP)</strong></td>
<td>29.0</td>
<td>17.0</td>
<td>46.0</td>
<td>19.5</td>
<td>10.3</td>
</tr>
</tbody>
</table>

X 1,000,000 square feet
<table>
<thead>
<tr>
<th>Massachusetts Life Sciences Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Total Space</strong></td>
</tr>
<tr>
<td>46.0 Million Square Feet</td>
</tr>
<tr>
<td>89,000 people currently employed</td>
</tr>
<tr>
<td>515 square feet / employee</td>
</tr>
<tr>
<td><strong>Low Range of Total Proposed Space</strong></td>
</tr>
<tr>
<td>10.3 Million Square Feet</td>
</tr>
<tr>
<td>20,000 new employees needed</td>
</tr>
<tr>
<td>515 square feet / employee</td>
</tr>
<tr>
<td><strong>High Range of Total Proposed Space</strong></td>
</tr>
<tr>
<td>19.5 Million Square Feet</td>
</tr>
<tr>
<td>38,000 new employees needed</td>
</tr>
<tr>
<td>515 square feet / employee</td>
</tr>
</tbody>
</table>
Expanding the Pool of Workers: Specific Workforce Challenge Areas

Presentations and Facilitated Group Discussions:

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- Ending Talent Wars: Growing the Clinical Research Talent Pool
- Big Tech vs. Biotech: Winning the Competition for Talent in Data Science
- Hiring and Securing Foreign-Born Talent
- Meeting the Growing Demand for Biomanufacturing Talent
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